

**OUTBREAK OF NOROVIRUS GASTROENTERITIS AMONG
PARTICIPANTS OF BIKING ACROSS KANSAS --
JUNE 2006: Final Report**



Investigation by:

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INTRODUCTION

On June 15, staff from the Cowley and Wilson County Health Departments contacted Kansas Department of Health and Environment's Epidemiology Services Section (ESS) about a potential gastrointestinal outbreak among participants in Biking Across Kansas (BAK), an annual recreational cycling event that starts at the western Kansas-Colorado border and ends at the Kansas-Missouri border. Preliminary information indicated that approximately 20 BAK participants had become ill with nausea, vomiting, and diarrhea; 8 were hospitalized.

With the cooperation of BAK staff, ESS initiated an outbreak investigation on June 16. The purpose of the investigation was to characterize the outbreak, to identify potential risk factors associated with illness, and to recommend and implement appropriate prevention and control measures.

BACKGROUND

BAK 2006 began on Friday, June 9 near Johnson City, KS and concluded on June 17 at Mulberry, KS. Approximately 870 persons from 33 states participated in BAK 2006. Participants ate food from a variety of venues, including meals prepared by local civic groups, food from commercial vendors, and a few meals provided by BAK coordinators. Throughout the day, support and gear (SAG) stops were located every 10 to 15 miles for cyclists to replenish food and water supplies. During the week-long event, most participants resided in camping tents or school gymnasiums.

Initial reports from the local health departments indicated between 15 and 20 BAK participants had become ill. Common symptoms included nausea, vomiting, and diarrhea.

METHODS

Epidemiologic Investigation

A cohort study was conducted to assess associations between potential exposure sources and illness. Because the response rate was only 57%, odds ratios were calculated. Risk factor and illness information was collected for BAK participants, staff, and volunteers. Persons attending breakfast on June 17 were asked to complete a self-administered survey. To capture information from individuals who were not present at the June 17 breakfast, an online version of the survey was posted on a secure Internet site from June 21 to June 27.

Cases were defined as persons who participated in or were associated with BAK 2006 and became ill with diarrhea (3 or more loose stools within 24 hours) and/or vomiting between June 9 and June 19, 2006. Persons who became ill after June 19, 2006 were considered secondary cases, and were not included in analyses to examine associations between exposures and illness.

Odds ratios with 95% confidence intervals were calculated for each food item at a SAG stop and for the provided meals. Cases were included in the individual event analysis if their onset was 1 – 2 days prior to the event. Also, SAG items (fruit, snack, water, and other) were analyzed together.

Laboratory and clinical

Eleven stool and three vomitus specimens were collected from BAK participants seeking medical care in Wilson, Cowley, and Crawford counties. Following preliminary testing at local laboratories, the specimens were forwarded to the KDHE Division of Health and Environmental Laboratories (DHEL) for additional testing.

Public Health Measures

In Wilson County, the local health department, along with Emergency Medical Services (EMS) and the local hospital, set up a triage unit for ill participants. Wilson County Health Department utilized the Regional Emergency Preparedness Van for communication, data collection, and triage.

In Crawford County, the local health department initiated preventive measures to minimize the spread within the county. Crawford County Health Department alerted the Sheriff's Department, local hospitals, EMS and food workers of the outbreak. In addition, extra hand washing and portable restrooms were organized in towns where BAK stops were scheduled.

RESULTS

Epidemiologic

Four hundred and ninety-three surveys (58%) were collected from the 847 listed participants. Of these, 126 (25%) met the case definition. The cases and non-cases were similar in age, participant type, and state of residence (Table 1). A higher percentage of cases were male compared to non-cases.

Table 1: Characteristics of Cases and Non Cases.

	Case	Non Case
Number	126	367
Age		
Median	51	51
Range	9 - 76	1 - 77
Gender (%)		
Male	76.1	57.5
Female	22.2	39.0
Unknown	<1	<1
Participant Type (%)		
Cyclist	95.2	87.5
BAK staff	2.5	1.6
SAG staff	1.6	3.5
Relative of rider	4.9	7.0
Other	0.0	3.0
State (%)		
Kansas	77.9	73.8
Not in Kansas	22.1	26.2

Of the 126 cases, the most common symptom reported was diarrhea followed by vomiting and abdominal cramps (Table 2). Onsets of illness ranged from June 9, the first day of the event,

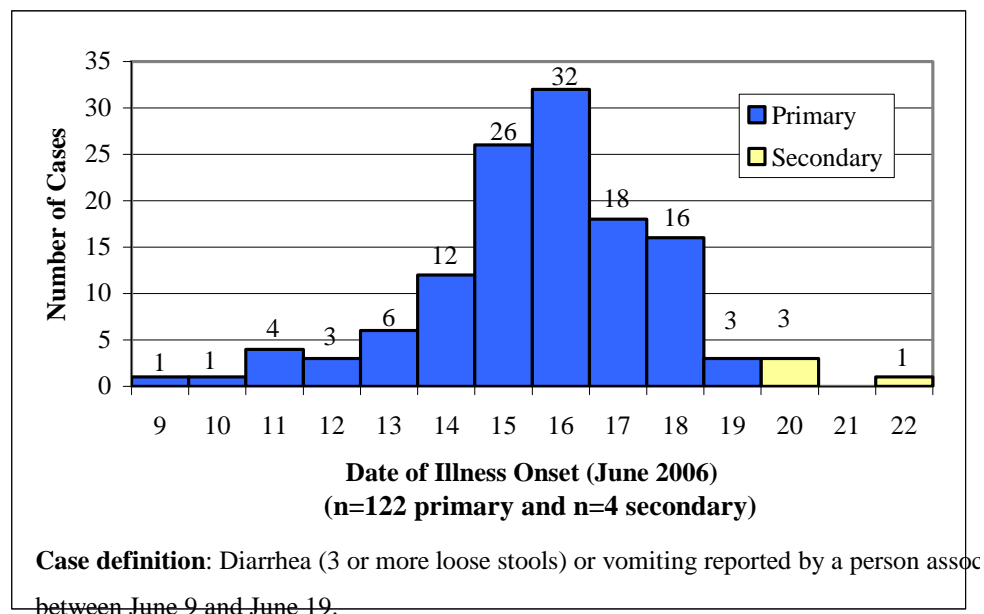
through June 22, five days after the event ended. Forty-six percent of the cases became ill on June 15 and 16, 2006 (Figure 1). The recovery period ranged from 6 hours to 7 days. The average recovery period was 2.6 days.

Table 2: Features of Illness as Reported by Cases (n=126)

	(%)
Diarrhea	91.1
Vomiting	67.7
Abdominal Cramps	50.8
Fever	46.0
Nausea*	24.2

* On the initial online survey, nausea was left of as a symptom and more persons may have had nausea than reported.

Figure 1: Epidemiologic Curve of Cases by Onset - BAK 2006.



Several of the SAG stops along the route were significantly associated with increased odds of becoming ill (Table 3). The other SAG stops and provided meals were not significantly associated.

Table 3: Events on BAK Significantly Associated with Becoming Ill.

Event	Date	OR (95% CI)	Cases (n)
SAG, Fruit	6/14	3.2 (1.1, 9.2)	56
SAG, Water	6/14	9.7 (1.3, 72.0)	57
SAG, Water	6/15	4.4 (1.0, 18.9)	47
SAG, Other	6/15	3.5 (1.7, 6.9)	40
SAG, Snack	6/16	2.9 (1.1, 7.3)	28
SAG, Other	6/16	2.5 (1.1, 5.5)	27

Laboratory and clinical

Ten of the stool specimens and two of the vomitus specimens tested positive for norovirus at DHEL. One stool specimen tested positive for rotovirus at a private laboratory. None of the samples tested positive for *Salmonella*, *Shigella*, *Campylobacter*, *Escherchia coli O157*, or intestinal parasites. Nine specimens were forwarded to the Public Health Laboratory at the Minnesota Department of Health. Eight of these samples were sequenced. Of the eight samples, seven had identical sequences and the remaining sample only differed by 3 bases.

CONCLUSION

The outbreak was propagated by person-to-person transmission. No single event was identified as the cause of the outbreak. However, several food items at SAG stops were associated with increased odds of becoming ill. Infected persons who handled food or drink items without washing their hands likely propagated the spread of infection to healthy individuals. The lack of handwashing stations along the route and at SAG stops, lack of bathroom facilities and participants self-serving at the SAG stops all contributed to the spread of the outbreak. Counties along the route have not reported any community-wide spread or other outbreaks that were linked to BAK 2006.

Norovirus is the leading cause of foodborne illness in the United States; an estimated 28 million people are infected with Norovirus every year—40% of these infections may be foodborne.¹ Onset of diarrhea and vomiting are common 12-48 hours after infection, and may last from 12 to 60 hours. Vomiting is more prevalent in children than adults. The disease is transmitted through fecal-oral routes; historically, norovirus outbreaks have been associated with fecally contaminated foods, especially ready-to-eat foods such as salads, sandwiches, ice, cookies, and fruit.²

Transmitted primarily through the fecal-oral route, norovirus particles may be spread through direct contact or through consuming fecally-contaminated food or water. Results from outbreak investigations have also suggested that spread via aerosolized vomitus is possible. Because noroviruses are highly contagious, requiring less than 100 organisms for infection, transmission among staff and residents at healthcare facilities may occur via hand-to-mouth activities following the handling of materials, fomites, and environmental surfaces contaminated with feces or vomitus³.

RECOMMENDATIONS

The spread of norovirus can be reduced by:

- Providing hand washing stations at SAG stops for participants to use before accepting food and drink.
- Using hand sanitizers when using restroom facilities on the roadside where hand washing is not possible.
- Food and drink should be given to participants rather than self-service at SAG stops.

ADDITIONAL INFORMATION

A norovirus factsheet can be located at <http://www.cdc.gov/ncidod/dvrd/revb/gastro/noro-qa.pdf>.

OUTBREAK INVESTIGATORS

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Our Vision and Mission

As the state's environmental protection and public health agency, KDHE promotes responsible choices to protect the health and environment for all Kansans.

Through education, direct services, and the assessment of data and trends, coupled with policy development and enforcement, KDHE will improve health and quality of life. We prevent injuries, illness, and foster a safe and sustainable environment for the people of Kansas.

¹ Mead PS. Food related illness and death in the United States. Emerging Infectious Diseases, 1999. 5(6):607-625.

² Centers for Disease Control and Prevention. "Diagnosis and Management of Foodborne Illnesses: A Primer for Physicians and other Health Care Professionals." MMWR 2004;53(No. RR-4).

³ <http://www.cdc.gov/ncidod/hip/gastro/norovirus.htm>